

TABLE 4 Cost Summary for EPA's Preferred Alternative (with 0.0 % Discount Rate)

TASK	UNIT COST	UNIT	QUANTITY / SUBTOTAL
PRECONSTRUCTION			
Mobilization, Demobilization and Site Restoration (project)	\$800,000	LS	1
Mobilization, Demobilization and Site Restoration (seasonal)	\$120,000	YEAR	8.6
Land Lease for Operations and Staging	\$250,000	YEAR	8.6
Contractor Work Plan Submittals	\$100,000	YEAR	8.6
Barge Protection	\$80,000	LS	1
Subtotal:			\$4,925,966
PROJECT MANAGEMENT (CONTRACTOR)			
Labor and Supervision	\$62,000	MONTH	39.0
Construction Office and Operating Expense	\$21,600	MONTH	39.0
Subtotal:			\$3,262,484
DREDGING			
Shift Rate	\$25,963	DAY	761.0
Gravity Dewatering (on the barge)	\$10	CY	790,664
Subtotal:			\$27,664,177
SEDIMENT HANDLING AND DISPOSAL			
Transloading Area Setup	\$1,000,000	LS	1
Water Management	\$10,000	DAY	761.0
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	\$60	TON	1,185,997
Subtotal:			\$79,769,663
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL			
Debris Sweep	\$30,000	ACRE	2
Shift Rate (12 hours)	\$12,500	DAY	501.6
Cap material procurement and delivery (sand)	\$27	CY	534,103
Subtotal:			\$20,790,501
ENHANCED NATURAL RECOVERY			
Debris Sweep	\$30,000	ACRE	5
Shift Rate (12 hours)	\$12,500	DAY	46
Material procurement and delivery (sand)	\$27	CY	28,824
Material procurement and delivery (carbon amended sand)	\$161	CY	28,824
Subtotal:			\$6,151,246
CONSTRUCTION QA/QC			
Construction Monitoring	\$7,925	DAY	761.0
Subtotal:			\$6,030,995
POST-CONSTRUCTION PERFORMANCE MONITORING			
Compliance Testing (Dredging)	alt specific	PROJECT	\$1,202,024
Compliance Testing (Capping)	alt specific	PROJECT	\$1,112,168
Compliance Testing (ENR)	alt specific	PROJECT	\$1,221,569
Subtotal:			\$3,535,761
CAPITAL COST (BASE)			\$152,130,792
CAPITAL COST (present value; assume 0.0 % percent discount)			\$152,130,792
Construction Contingency			\$53,245,777
Sales Tax			\$14,452,425
Project Management, Remedial Design and Baseline Monitoring			\$45,639,238
Construction Management			\$15,213,079
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)			\$280,681,312
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (present value)			
Agency Review and Oversight	alt specific	PROJECT	\$10,200,000
Reporting	alt specific	PROJECT	\$1,900,000
Operations and Maintenance (Dredging)	alt specific	PROJECT	\$1,416,056
Operations and Maintenance (Capping)	alt specific	PROJECT	\$5,907,000
Operations and Maintenance (ENR)	alt specific	PROJECT	\$6,352,496
Operations and Maintenance (MNR >SQS)	alt specific	PROJECT	\$2,250,956
Operations and Maintenance (MNR <SQS)	alt specific	PROJECT	\$8,978,076
Long-term Monitoring	alt specific	PROJECT	\$5,775,580
Institutional Controls	alt specific	PROJECT	\$25,010,000
Subtotal:			\$67,790,164
TOTAL COST (Net Present Value)			\$348,000,000

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.
2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.
3. Operations & Maintenance and Monitoring Costs includes repair for capping and ENR.
4. Present value calculation applied to both capital costs and O&M and monitoring costs starting at the beginning of construction.

CY = cubic yard; ENR = enhanced natural recovery; LS = lump sum; MNR = monitored natural recovery; O&M = operation and maintenance; QA/QC = quality assurance/quality control; SQS = sediment quality standard

TABLE I-35 NET PRESENT VALUE CALCULATION FOR INSTITUTIONAL CONTROLS

i= 0.0%

Year, n	Annual Cost				Present Value Factor ¹	Present Value			
	Informational Devices	Proprietary Controls	Enforcement Tools	Sum of Year "n" Costs		Informational Devices	Proprietary Controls	Enforcement Tools	Sum of Year "n" Costs
0				\$0	1.00	\$0	\$0	\$0	\$0
1	\$660,000	\$10,000	\$50,000	\$710,000	1.00	\$660,000	\$10,000	\$50,000	\$710,000
2	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
3	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
4	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
5	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
6	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
7	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
8	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
9	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
10	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
11	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
12	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
13	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
14	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
15	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
16	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
17	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
18	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
19	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
20	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
21	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
22	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
23	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
24	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
25	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
26	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
27	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
28	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
29	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
30	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
31	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
32	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
33	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
34	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
35	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
36	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
37	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
38	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
39	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
40	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
41	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
42	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
43	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
44	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
45	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000
46	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
47	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
48	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
49	\$460,000	\$0	\$0	\$460,000	1.00	\$460,000	\$0	\$0	\$460,000
50	\$610,000	\$0	\$25,000	\$635,000	1.00	\$610,000	\$0	\$25,000	\$635,000

Totals	<u>\$24,700,000</u>	<u>\$10,000</u>	<u>\$300,000</u>	<u>\$25,000,000</u>		<u>\$24,700,000</u>	<u>\$10,000</u>	<u>\$300,000</u>	<u>\$25,000,000</u>
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Notes:

1. Annual costs based on Table I-34.

TABLE I-37 BASIS FOR COST ESTIMATES¹

Project Phase	Quantity	Units	Source	Notes
<u>Sediment Handling and Disposal Costs</u>				
Transload, Railcar transport to and tipping at Subtitle D Landfill	\$60	per ton	Joe Casalini, Allied Waste Services, Seattle, WA	Cost includes material transfer from barge onto offloading area, load dewatered sediment onto truck with containers, truck transport to rail facility. Offloading of sediments from barges at an offloading facility (infrastructure to be built in the future) in the vicinity of site to transloading area. Trucks with 20-ft containers on chassis and fitted with liner.
Transloading Area Setup	\$1,000,000	LS	BPJ	Based on Table I-8. Value based on discussions with waste management engineers.
Water Management	\$10,000	per day	Project experience	Based on Table I-8. Value based on discussions with contractors with local experience and reviewed by Hartman, 2011.
<u>Capping/ENR</u>				
Debris Sweep	\$30,000	per acre	Reviewed by Hartman 2011	Assume 10% of capping/ENR area requires debris sweep. Assume cost includes labor, equipment and survey.
Shift Rate	\$12,500	per day	Provided by Hartman 2011	Assuming 1 operation split between deep access and shallow access, at 12-hr (5-day weeks)
Cap Placement Rate (deep water)	1,469	cy per day (12-hr)	Project experience	Based on Table I-6 (Derrick barge with environmental bucket: 8-cy bucket)
Cap Placement Rate (shallow water)	1,148	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Excavator: 5-cy bucket)
Cap Placement Rate (underdock)	350	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Hydraulic conveyor)
ENR Placement Rate (deep water)	1,371	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Derrick barge with environmental bucket: 8-cy bucket)
ENR Placement Rate (shallow water)	1,071	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Excavator: 5-cy bucket)
ENR Placement Rate (underdock)	300	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Hydraulic conveyor)
Cap/ ENR/ backfill/ dredge residuals material procurement and delivery (Sand)	\$27	per cy	Glacier Northwest, Seattle, WA	Based on Table I-7. Cost includes delivery to the site by barge, additional cap material (10% of total cap volume) included to account for capping material required in steep slope areas to address slope stability.
Carbon amended material procurement and delivery (Sand+4% GAC)	\$161	per cy	Luthy et al. 2009	Based on Table I-7. Assumes \$1/lb of carbon at 4% by volume of carbon/(sand+carbon).
<u>Treatment by Soil Washing, Mechanical Dewatering & Water Trmt</u>				
Mob/Demob, Site Layout, Land Leasing Costs	\$4,000,000	LS	ART Engineering, LLC., Tampa FL.	Includes capital cost from conception to production, total plant footprint of approximately 4 acres to 7 acres with 40 to 45 tons per hour capacity.
Soil Washing, Mech Dewatering, Water Trmt, disposal of fine fraction	\$120	per cy	ART Engineering, LLC., Tampa FL.	Assume 50% sand treated sand and 50% remaining fines. Cost includes labor, plant operations, maintenance fine fraction, disposal of remaining fine fraction at Subtitle D landfill, and no credit for beneficial reuse of sand.
Treated Sand Disposal	\$0	per cy	BPJ	Assume no credit for beneficial reuse of sand. Treated sand may have a disposal cost.
<u>Construction QA/QC</u>				
Construction Monitoring	\$7,925	per day	Vendor quote and BPJ	Based on Table I-9. Construction monitoring includes survey boat, labor and equipment required for routine bathymetric surveys (single beam), data analysis, data delivery, pH/turbidity check, and water quality monitoring. Additional construction oversight is included in the 10% construction management cost described in Table I-37.
Analytical cost	\$2,268	per sample	Project experience	Assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions. Assumption incorporated in Tables I-11 through I-21.
Sampling rate	5	samples/day	Project experience	Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	4	samples/acre	Project experience	See Appendix K for sampling description. Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring physical sampling density (PDC, capping, ENR)	4	samples/acre	Project experience	See Appendix K for sampling description. Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring daily cost	\$8,000	per day	Project experience	Daily labor, equipment and material costs during performance monitoring. Assumption incorporated in Tables I-11 through I-21.
Data Management Analysis and Reporting	\$15,000	per acre	Project experience	Assume \$15,000 for first acre and scale up using power of 0.6. Assumption incorporated in Tables I-11 through I-21.
Project Completion Report (incl. as-built drawings)	\$50,000	per work year	Project experience	Assumption incorporated in Tables I-11 through I-21.
Remedial Action 5 year Review Cycle	\$250,000	LS	Project experience	Assumption incorporated in Tables I-11 through I-21.

TABLE I-23 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, LONG-TERM MONITORING

0.0%

Year ^a	Long-term Monitoring ^b					O&M Monitoring ^b					O&M Repair ^b		Annual Cost							Present Value Factor	Present Value ^f						
	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR>SOS	MNR<SOS	Cap & PDC	ENR	Agency Oversight ^c	Reporting ^c	O&M Dredging ^d	O&M Cap & PDC ^d	O&M ENR ^d	O&M MNR>SOS ^d	O&M MNR<SOS ^d		Long-term Monitoring ^e	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	
0 (baseline)	Y	Y	Y	Y	Y									\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$1,666,925	1.00	\$700,000	\$50,000	\$0	\$0	\$0
1														\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$50,000	\$0	\$0	\$0
2														\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$50,000	\$0	\$0	\$0
3		Y												\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$215,760	1.00	\$700,000	\$50,000	\$0	\$0	\$0
4														\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$50,000	\$0	\$0	\$0
5														\$700,000	\$300,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$300,000	\$0	\$0	\$0
6														\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$50,000	\$0	\$0	\$0
7														\$700,000	\$50,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$700,000	\$50,000	\$0	\$0	\$0
8														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
9		Y	Y		Y	Y	Y	Y	Y	Y				\$200,000	\$0	\$708,028	\$1,537,825	\$1,958,691	\$450,191	\$1,795,615	\$638,180	1.00	\$200,000	\$0	\$708,028	\$1,537,825	\$1,958,691
10									Y	Y				\$200,000	\$250,000	\$0	\$0	\$0	\$450,191	\$1,795,615	\$0	1.00	\$200,000	\$250,000	\$0	\$0	\$0
11		Y												\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$215,760	1.00	\$200,000	\$0	\$0	\$0	\$0
12						Y	Y	Y	Y	Y	Y	Y		\$200,000	\$0	\$708,028	\$2,184,588	\$2,196,903	\$450,191	\$1,795,615	\$0	1.00	\$200,000	\$0	\$708,028	\$2,184,588	\$2,196,903
13														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
14		Y	Y						Y	Y				\$200,000	\$0	\$0	\$0	\$0	\$450,191	\$1,795,615	\$288,180	1.00	\$200,000	\$0	\$0	\$0	\$0
15														\$200,000	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$250,000	\$0	\$0	\$0
16														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
17							Y	Y	Y	Y	Y	Y		\$200,000	\$0	\$0	\$2,184,588	\$2,196,903	\$450,191	\$1,795,615	\$0	1.00	\$200,000	\$0	\$0	\$2,184,588	\$2,196,903
18														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
19	Y	Y	Y											\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$716,925	1.00	\$200,000	\$0	\$0	\$0	\$0
20														\$200,000	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$250,000	\$0	\$0	\$0
21														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
22														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
23														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
24	Y	Y	Y											\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$716,925	1.00	\$200,000	\$0	\$0	\$0	\$0
25														\$200,000	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$250,000	\$0	\$0	\$0
26														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
27														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
28														\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$0	\$0	\$0	\$0
29	Y	Y	Y	Y										\$200,000	\$0	\$0	\$0	\$0	\$0	\$0	\$1,316,925	1.00	\$200,000	\$0	\$0	\$0	\$0
30														\$200,000	\$250,000	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$200,000	\$250,000	\$0	\$0	\$0

TABLE I-23 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, LONG-TERM MONITORING

0.0%

Year ^a	Long-term Monitoring ^b					O&M Monitoring ^b				O&M Repair ^b		Annual Cost							Present Value Factor	Present Value ^f						
	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR>SOS	MNR<SOS	Cap & PDC	ENR	Agency Oversight ^c	Reporting ^c	O&M Dredging ^d	O&M Cap & PDC ^d	O&M ENR ^d	O&M MNR>SOS ^d		O&M MNR<SOS ^d	Long-term Monitoring ^e	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR
31													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
32													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
33													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
34													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
35													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
36													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
37													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
38													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
39													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
40													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
41													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
42													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
43													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
44													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
45													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
46													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
47													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
48													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
49													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
50													\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	1.00	\$0	\$0	\$0	\$0	\$0
Totals													\$10,200,000	\$1,900,000	\$1,416,056	\$5,907,000	\$6,352,496	\$2,250,956	\$5,775,580			\$10,200,000	\$1,900,000	\$1,416,056	\$5,907,000	\$6,352,496

Notes:

- Costs from the start of construction. Construction years are shaded.
- Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.
- See I-37 for assumptions.
- O&M monitoring and repair costs per event are based on Table I-11
- Long-term monitoring costs per event are based on Table I-22
- Values equal to the annual cost times the present value factor.

O&M MNR>SQS ^d	O&M MNR<SQS ^d	Long-Term Monitoring
\$0	\$0	\$1,666,925
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$215,760
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$450,191	\$1,795,615	\$638,180
\$450,191	\$1,795,615	\$0
\$0	\$0	\$215,760
\$450,191	\$1,795,615	\$0
\$0	\$0	\$0
\$450,191	\$1,795,615	\$288,180
\$0	\$0	\$0
\$0	\$0	\$0
\$450,191	\$1,795,615	\$0
\$0	\$0	\$0
\$0	\$0	\$716,925
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$0
\$0	\$0	\$1,316,925
\$0	\$0	\$0

TABLE I-22 BASELINE AND LONG-TERM MONITORING

Monitoring Costs per Event

Surface Sediment			
	Total Sediment Analytical Cost	\$	285,830
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	\$	142,915
	Total cost per event	\$	428,745

Tissue			
	Total Tissue Analytical Cost	\$	143,840
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	\$	71,920
	Total cost per event	\$	215,760

Surface Water Quality			
	Total Surface Water Analytical Cost	\$	48,280
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	\$	24,140
	Total cost per event	\$	72,420

Survey Costs per Event

Bathymetric Survey			
Bank-to-bank site-wide multi-beam bathymetric survey		\$	100,000
Other Miscellaneous Surveys			
Benthic survey or other (scope to be defined) (cost per event)		\$	250,000
	Total cost per event	\$	350,000

Upstream Loading Sampling

One multi-media sampling event after site equilibrium is reached in sediment (cost proportional to the site-wide sampling event)	Total cost per event	\$	600,000
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Notes:

1. See Tables I-23 through I-33 for monitoring frequency for each remedial alternative, based on Appendix K.
2. Baseline monitoring to occur before construction in year 0. Long-term monitoring at intervals of 5, 10, and 15 years after the active portion of remedy is completed for alternatives that take 10 years or less to construct (Alternatives 2R, 2R-CAD 3R, 3C, 4C and 5C). Assume one additional sample round for Alternatives 4R, 5R, 5R-T, and 6C. Assume two additional sample rounds for Alternative 6R.
3. The purpose of baseline sampling is to establish surface sediment, tissue, and water quality conditions.

TABLE I-37 BASIS FOR COST ESTIMATES¹

Project Phase	Quantity	Units	Source	Notes
<u>Cost Estimating Parameters & Methodology:</u>				
Discount Rate	0.0%		OMB Circular A-94	30 year real discount rate is 2.3%. This assumes no discount.
Project Management and Remedial Design	30.0%		EPA, July 2000	Includes 10% toward project management and 20% toward remedial design. Selected percentages are the high end specified in the EPA cost guidance document due to the complex nature of the sediments project. Remedial design includes pre-design sampling and analysis, engineering survey, design plans and specifications, cost estimate, and schedule.
Construction Management	10.0%		EPA, July 2000	The selected percentage (10%) is in the mid to high range as specified in the EPA cost guidance document. A higher percentage was selected due to the complex nature of the project. Construction monitoring is included as a separate line-item below.
Sales Tax	9.5%			Washington State
Contingency	35.0%		EPA, July 2000	Total contingency includes 20% toward scope contingency and 15% toward bid contingency. Scope contingency is toward the high end specified in the EPA cost guidance document, because project scope for a sediments project of this magnitude will likely change considerably between FS and final design. Bid contingency of 15% is mid-range of the values specified in the EPA cost guidance document.
Agency Review and Oversight (construction)	\$700,000	per year during construction	LDW project experience	Based on project experience during RI/FS
Agency Review and Oversight (monitoring)	\$200,000	per year during monitoring	Based on LDW project experience	Costs are expected to be higher or lower based on monitoring and review cycles, however, \$200,000 per year is a reasonable average value.
<u>Mobilization, Demobilization and Site Restoration (Dredging and Capping)</u>				
Mobilize/Demobilize Equipment and Facilities (project)	\$800,000	LS	Provided by Hartman, 2011	\$400,000 for mobilization plus \$400,000 for demobilization. Includes project management and labor during mobilization and demobilization. See Table I-10.
Mobilize/Demobilize Equipment and Facilities (construction season)	\$120,000	per year	Provided by Hartman, 2011	Yearly mobilization/demobilization is assumed to be 15% of the total project mob/demob cost of \$800,000 for all years of project. Includes project management and labor during mobilization and demobilization. See Table I-10.
Land Lease for Operations and Staging	\$250,000	per year	BPJ	Based on Table I-10. Professional judgment based on review of lease rates in the Lower Duwamish Valley.
Contractor Work Plan Submittals	\$100,000	per year	BPJ	Based on Table I-10. Professional judgment based on local dredging contractor.
Barge Protection	\$80,000	LS	BPJ	Based on Table I-10. Professional judgment based on local dredging contractor.
<u>Project Management (Contractor)</u>				
Labor and Supervision	\$62,000	per month	BPJ	Based on Table I-10. Includes superintendent, chief surveyor and quality control management, accountant, certified industrial hygienist, travel, and housing.
Construction Office and Operating Expense	\$21,600	per month	BPJ	Based on Table I-10. Includes rental office trailers, operating expense, vehicle rental, support staff.
<u>Contained Aquatic Disposal</u>				
Impacted Material/Clean Cap Material Placement Rate (Derrick Crane - 8 cy bucket)	1,469	cy per day (12-hr)	Project experience	Based on Table I-6, assumptions for open-water placement
Overburden Removal Rate from CAD Cell (Derrick Crane - 6 cy bucket)	1,500	cy <i>in situ</i> per day (12-hr)	Reviewed by Hartman, 2011	
Transport and Disposal of Material at Elliott Bay Open Water Site	\$12	cy	Reviewed by Hartman, 2011	Includes barge transport and disposal at the DMMP Elliott Bay open water disposal site.
<u>Dredging</u>				
Shift Rate	\$25,963	per day	Provided by Hartman, 2011	Based on Table I-8. Assume 2 dredging operations, one deep access and one shallow access, split between 24-hr and 12-hr dredging days as outlined in Table I-5. Includes 3 barges and 4 tugs.
Dredge Rate (open-water)	1,039	cy <i>in situ</i> per day	Project experience: USACE, 2008	
Dredge Rate (underpier)	240	cy <i>in situ</i> per day	Reviewed by Hartman, 2011	Based on Table I-5
Gravity Dewatering (on the barge)	\$10	per cy	Reviewed by Hartman, 2011	

TABLE I-37 BASIS FOR COST ESTIMATES¹

Project Phase	Quantity	Units	Source	Notes
<u>Operations, Maintenance and Monitoring Costs</u>				
Analytical cost	\$2,268	per sample	Project experience	Assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions. Assumption incorporated in Tables I-11 through I-21.
Sampling rate	5	samples/day	Project experience	Assumption incorporated in Tables I-11 through I-21.
O&M monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	2	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring physical sampling density (PDC, capping)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring physical sampling density (ENR, MNR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring coring sampling density (PDC and capping)	1	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring porewater sampling density (PDC and capping)	1	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring porewater sampling density (ENR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
OM&M Sampling Daily Cost	\$8,000	per day	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33
Data Management Analysis and Reporting	\$15,000	per acre	Project experience	Assume \$15,000 for first acre and scale up using power of 0.6. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
Cap Repair	\$300,000	per acre	Project experience	Assumed for 5% of the cap area implemented at Year 5 and 10. Based on approximately 60% of unit costs for materials and labor for capping. Assumption incorporated in Tables I-11 through I-21.
ENR Repair	\$100,000	per acre	Project experience	Assumed for 5% of the ENR area implemented at Year 5 and 10. Based on approximate unit costs for materials and labor for ENR. Assumption incorporated in Tables I-11 through I-21.
OM&M Bathymetric survey	\$100,000	site-wide per event	Vendor quote for LDW	Vendor quote - Bathymetry costs calculated by scaling estimated site-wide cost of \$100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = Cost(site-wide) * (Area A/418 acres) ^{0.6} . Assumption incorporated in Tables I-11 through I-21.
<u>Long-term Monitoring</u>				
Surface Sediment	\$428,745	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33,
Tissue	\$215,760	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33,
Surface water Quality	\$72,420	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33,
Survey Cost	\$350,000	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33,
Stormwater Sampling	\$500,000	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33,
<u>Institutional Controls</u>				
Institutional Controls	\$25,000,000	present value for 50 years	EnviroIssues, Tom Newlon, and BPJ	Based on Tables I-34 and I-35.

TABLE I-5 DREDGE PRODUCTION ESTIMATE

Open Water Dredge Production Rate Estimate

Parameter	Derrick Barge with Environmental Bucket (deep water)	Precision Excavator (deep water)	Precision Excavator (shallow water)
24-hr Operation			
Cycle Time (min)	3.5	3	2.5
Bucket Capacity (cy)	6	5	3
Bucket Fill Factor (@ 55%; cy) ^a	3.3	2.8	1.7
Bucket Fill Factor (@ 40%; cy) - Debris Sweep	2.4	2	1.2
Operating Day (hrs/day)	24	24	24
Effective Working Time (%) ^b	60%	60%	60%
Daily Dredge Production (cy/day)	815	792	570
Daily Dredge Production (cy/day) - Debris Sweep	592	576	415
Combined Dredge Production (cy/day) (10% debris sweep, 90% without debris sweep)	792	770	555
Combined Dredge Production (tons/day @ 1.5 tons/cy) ^c	1,189	1,156	832
Total Combined Dredge Production with One Open Water Operation (Split Between Environmental Bucket and Excavator) and One Shallow Water Operation (tons/day)	2,004		
12-hr Operation			
Combined Dredge Production (cy/day) ^d	396	385	277
Combined Dredge Production (tons/day) ^d	594	578	416
Total Combined Dredge Production with One Open Water Operation (Split Between Environmental Bucket and Excavator) and One Shallow Water Operation (tons/day)	1,002		

Annual Open Water Dredge Production Rate Estimates

Total In-water Construction Window (October 1 through February 15; days)	138
Days per week of operation (days)	5 and 6
Weekend days without operation (days)	29.6
Holidays (days)	5.0
Lost Time (days)	15.0
Net dredging days per season (days)	88.4
Net dredging days per season @12 hrs/day (assume operation 5 days/week; days)	39.3
Net dredging days per season @24 hrs/day (assume operation 6 days/week; days)	49.1
Annual tonnage (tons/year)	137,856
Annual volume removed (cy/year)	91,904
Average dredge production per operational day (tons/day)	1,559
Average dredge production per operational day (cy/day at 1.5 tons/cy)	1,039

Underpier Dredge Production Rate Estimate

Operating Day (hours)	12
Effective Working Time (%)	65%
Daily Production (cy/day)	240

Notes:

- Construction window: October 1 through February 15.
- Construction window is split equally (by number of weeks) between 24 hrs/day and 12 hrs/day operations.
- Assume simultaneous open-water (split between environmental bucket and excavator) and shallow equipment operations (i.e., 2 equipment sets).
 - USACE 2008. *Technical Guidelines for Environmental Dredging of Contaminated Sediments*. ERDC/EL TR-08-29.
 - ibid. Operating efficiency includes allowance for non-production activities such as equipment maintenance/repair, water quality management, navigation systems, agency inspections, waiting for test results, moving dredges/barges, traffic, standby for navigation and refueling.
 - Assumes sediment bulk density of 1.5 tons/cy.
 - Calculations for 12-hr operations use same root assumptions as shown above for 24-hour operations.

TABLE I-6 MATERIAL PLACEMENT PRODUCTION ESTIMATE

Capping Production Estimate Open Access Below -10 ft - Derrick Barge with environmental bucket	
Cycle Time	2.5 min
Bucket Capacity	8 cy
Bucket Fill Factor (85%)	6.8 cy
Operating Day	12 hrs
Effective Working Time	75%
Daily Production	1,469 cy/day

ENR Production Estimate - Open Access Below -10 ft - Derrick Barge with environmental bucket	
Cycle Time	2.5 min
Bucket Capacity	8 cy
Bucket Fill Factor (85%)	6.8 cy
Operating Day	12 hrs
Effective Working Time	70%
Daily Production	1,371 cy/day

Capping Production Estimate - Above -10 ft - Precision Excavator	
Cycle Time	2 min
Bucket Capacity	5 cy
Bucket Fill Factor (85%)	4.25 cy
Operating Day	12 hrs
Effective Working Time	75%
Daily Production	1,148 cy/day

ENR Production Estimate - Above -10 ft- Precision Excavator	
Cycle Time	2 min
Bucket Capacity	5 cy
Bucket Fill Factor (85%)	4.25 cy
Operating Day	12 hrs
Effective Working Time	70%
Daily Production	1,071 cy/day

Capping Production Estimate - Underdock - Hydraulic, conveyor	
Operating Day	12 hrs
Daily Production	350 cy/day

ENR Production Estimate - Underdock - Hydraulic, conveyor	
Operating Day	12 hrs
Daily Production	300 cy/day

Notes:

1. These calculation are performed with logic consistent with dredging production rate calculations in Table I-5 and USACE, 2008.

TABLE I-7 MATERIAL PLACEMENT UNIT COST

Sand (8/30 Sieved)

Base cost	\$	13.00 /Ton		
Delivery	\$	3.70 /Ton	\$	5.99 /cy
Total	\$	16.70 /Ton	\$	27.05 /cy

Granular Activated Carbon (GAC) Amended Sand

Base cost (delivered)	\$	1.07 /lb		
Base cost (delivered)	\$	2,140.00 /Ton	\$	1,155.60 /cy
Mixing percentage (% by volume GAC/sand)		4%		
Total	\$	102.30 /Ton	\$	161.48 /cy

Assumed Unit Weight

Capping Material	1.62 ton/cy
Granular Activated Carbon	0.54 ton/cy

Tow / Barge Delivery Surcharge Calc

	60 nautical miles RT
	5 knots avg
	12 hrs sail
	400 tons/hr loading
	1500 tons capacity
	3.75 hrs loading
	15.75 total hrs
	\$300.00 per hr, tug
	\$50.00 per hr., barge
	\$350.00 per hr., total
	\$5,512.50 trip cost
	\$3.70 add'l per ton

Notes:

1. Sand costs from DuPont RM and Pioneer Aggregates, DuPont, WA
2. GAC costs from Luthy et al. 2009

TABLE I-8 TRANSLOADING, WATER MANAGEMENT, AND DREDGING DAILY

Transloading and Water Management

	Cost Unit	Notes
Transloading Area Setup	\$1,000,000 LS	Best professional judgment order of magnitude cost for facility set-up
Water Management	\$10,000 per day	Water management cost typical for relatively large-scale remediation projects in the Northwest

Dredging Daily Rate Assumptions

	Cost Unit	Notes
Labor	\$5,750 12-hr day	Includes superintendent, foreman, 2 operators, 4 deck hands, and boat operator (Hartman 2011).
Dredge	\$9,000 12-hr day	Includes one shallow and one deep dredge with tug for each (Hartman 2011).
Haul barge	\$3,000 day	Assume one 1,500 cy haul barge and two 1,000 haul barges (Hartman 2011).
Subtotal 12-hr operation	\$17,750 12-hr day	
Subtotal 24-hr operation	\$32,500 24-hr day	Assume double 12-hr day for labor and dredge no additional cost for haul barge
Average daily rate	\$25,963 day	Assume 39 days at 12 hrs and 49 days at 24 hrs

TABLE I-9 CONSTRUCTION MONITORING

Multi-Beam Survey Inclusive of Acquisition, Processing, and Data Delivery

Average of 2 quotes	\$	4,928 / Day
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Water Quality Sampling during Construction

	# of samples	Cost per sample	Total
Analytical cost	106	\$ 1,000	\$ 106,000 annual cost
Labor, equipment and materials cost	106	\$ 1,500	\$ 159,000 annual cost
Subtotal annual cost		\$	265,000 annual cost
Subtotal daily cost		\$	2,998 / Day

Total Construction Monitoring Daily Rate	\$	7,925 / Day
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Notes:

1. Multi-beam survey cost includes equipment and labor to collect bathymetric survey data, data processing and delivery, and labor/equipment to collect and document pH/turbidity data. Estimate from John Lally, Lally Consulting, Seattle, WA.
2. Water quality sampling costs assume four monitoring stations: three for the dredging event that occurs in deep water and one for the dredge that operates in shallow water close to the banks; one sampling event for every station every day during the field season, for a total number of field screening samples for general water quality parameters of 352 (88x4=352). The number of samples that will require chemical analysis for PCBs, arsenic and cPAHs is assumed to be 30% of the field screening samples (30% of 352 equals 106).
3. Total construction monitoring includes survey boat, labor and equipment required for routine bathymetric surveys (single beam), data analysis, data delivery, pH/turbidity check, and water quality monitoring. Additional construction oversight is included in the 10% construction management cost described in Table I-37.
4. Construction monitoring is assumed to occur during dredging (88 days/season) and is incorporated in capital costs in Tables I-39 through I-49.

TABLE I-10 MOBILIZATION, DEMOBILIZATION, AND CONTRACTOR PROJECT MANAGEMENT COSTS

Mobilization/Demobilization	Cost Unit	Notes
Mobilize/Demobilize Equipment and Facilities (project)	\$400,000 LS per mob	Start of project and end of project - includes mobilization of construction equipment for both dredging and material placement: 3 excavators (various bucket sizes), one clamshell, 2 derrick barges, 8 haul barges, 2 flat-decked barges, crew boat, survey boat (Hartman 2011).
Mobilize/Demobilize Equipment and Facilities (construction season)	\$120,000 per year	Yearly mobilization/demobilization is assumed to be 30% of the project mob/demob cost of \$400,000 for all years of project. Includes project management and labor during mobilization and demobilization (Hartman 2011).

Project Management and Operations	Cost Unit	Notes
Land Lease for Operations and Staging	\$250,000 per year	Based on review of lease rates in the Lower Duwamish Valley.
Site Office & Operating Expense	\$21,600 per month	Includes housing, trailer, boats, travel.
Contractor Work Plan Submittals	\$100,000 per year	Based on project experience.
Barge Protection	\$80,000 LS	Barge protection is necessary to mitigate wear to barges during dredging operations.
Labor and Supervision	\$62,000 per month	Includes project manager, chief surveyor and quality manager, works manager or superintendent, surveyor, accountant, certified industrial hygienist/ health and safety, physicals, HAZWOPER training.

Notes:

1. Cost assumptions for mobilization and demobilization reviewed in Hartman (2011).

TABLE I-34 INSTITUTIONAL CONTROLS

	Initial Cost	Annual Cost	Periodic Cost	Cost Basis	Source	
Informational Devices						
Monitoring and Notification of Waterway Users						
Initial Costs	\$100,000			0.5 FTE @ \$100/hr	Professional judgment	
Surveillance Monitoring	\$75,000	\$25,000		0.36 FTE for initial cost and 0.12 FTE for annual cost @ \$100/hr		
Cleanup Hotline	\$75,000	\$50,000		0.36 FTE for initial cost and 0.25 FTE for annual cost @\$100/hr		
Construction Permit Review	\$50,000	\$25,000		0.25 FTE for initial cost and 0.12 FTE for annual cost @\$100/hr		
Reporting to EPA and Ecology		\$25,000		0.12 FTE @ \$100/hr		
Seafood Consumption Advisories, Public Outreach and Education						
Baseline behavior research	\$150,000			0.72 FTE @ \$100/hr	Enviro Issues, Seattle, WA	
Incentives and messages development and delivery	\$75,000	\$50,000		0.36 FTE for initial cost and 0.24 FTE for annual cost @ \$100/hr		
Culturally-appropriate outreach	\$50,000	\$200,000		0.24 FTE for initial cost and 0.96 FTE for annual cost @\$100/hr		
Monitoring behavior change and revising approach	\$50,000	\$75,000	\$150,000	0.24 FTE for initial cost and 0.36 FTE for annual cost @\$100/hr		
Direct costs	\$25,000	\$10,000			Professional judgment	
Site Registry						
Deed Notice Filing	\$10,000					
	\$660,000	\$460,000	\$150,000			
Proprietary Controls						
Restrictive Covenants	\$10,000			\$100 per parcel. Total number of parcels to be addressed range from 27 to 60 for the alternatives.	Tom Newlon, Attorney Seattle, WA	
Easements						
Total Cost	\$10,000	\$0	\$0			
Enforcement Tools						
Agency Order	\$50,000			0.25 FTE @ \$100/hr	Professional judgment	
Agency 5-year Review		\$25,000		0.12 FTE @ \$100/hr		
Total Cost	\$50,000	\$25,000	\$0			

Notes:

1. Initial cost includes activities used to establish or setup institutional controls. This is a one-time cost and is not recurring.
2. Annual costs include activities performed on a regular basis (annual) to monitor and maintain the institutional controls.
3. Periodic costs include activities needed in response to specific events during institutional controls monitoring and maintenance (e.g., address potential institutional controls failure during monitoring).
4. Assumes institutional controls would begin after Record Of Decision is signed and annual costs would begin in Year 2. Annual costs applied to Year 50.
5. Periodic costs applied at Year 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50. See I-35 for cost frequency.

FTE = full time equivalent